ANALYZE QUEUE PERFORMANCE USING ARENA 16.0 SOFTWARE (Z Cinema Case Study)

Fredlina[1], Sofwan[2], Ariska[3], Fergyanto E. Gunawan[4]

1,2,3,4) Industrial Engineering Departmeen,, BINUS Graduate Program – Master of Industrial Engineering, Universitas Bina Nusantara, DKI Jakarta, 11480, Indonesia

*Corresponding author, e-mail: : fredlina.margaret@binus.ac.id, sofwan.fakhrudin@binus.ac.id, Ariska.pratiwi@binus.ac.id, fgunawan@binus.edu

Abstract

Queues are often found in everyday life, such as waiting for cinema counters, check-in queues at airports and self-service cashier queues. Service facilities for a long time cause queues because they cannot meet the needs or capacity, so facility users have to wait. As in the example of the case of Cinema Z in Solo City has a maximum queue time of 13.6 minutes with a maximum number of queues of 11 people until served. This can cause customers to wait long enough to get movie tickets. This problem can be overcome by the need to manage the counter operator so that it can regulate when to open a new counter so that there is no queue. This research discusses the problem of queuing models at Cinema Z in Solo, Central Java Province. From the results of the analysis that can be known the performance values of the queuing system such as waiting time, number in, number out, dan number waiting.

Keywords: *Arena, Queue Model, Simulation Model, Cinema Queue*

Introduction

Today's life, all societies want fast-paced activities and services. Speed and time savings are very supportive for carrying out all life activities. One of the activities that requires speed and time savings is queuing. In everyday life a person often experiences the thing to wait in line for a long time and this is something that causes boredom. And it's great to get a service that doesn't have to wait. Waiting for long queues can be caused by a lack of facilities to serve the community or the number of service counters that exist inadequate to serve the community, as well as the lack of responsiveness of servants to serve the community or consumers.

A queuing process is a process related to the arrival of a customer at a service facility, then waiting in a line (queue) if all the waiters are busy, and finally leaving the facility (Taha, H.A. 1997) . A queuing system is a set of customers, waiters and a rule governing the arrival of customers and the processing of the problem (Bronson, Richard, and Hans J. Wospakrik 1982). Suad Husna (1982) in his book entitled "Queuing Theory", it is said that one of the proper ways to solve the queuing problem is to use the method of simulating the whole problem to design an experiment that will mimic as closely as possible the actual state of affairs and then observe what will happen.

This simulation method is one of the effective methods to solve the queue problem. Simulation is a methodology for carrying out experiments using models from one real system (Siagian, 1987). According Hasan (2002), Simulation is a model of

decision making by modeling or using the true image of a real-world life system without having to experience it in its true state. In research conducted at cinema Z using Arena 16.0 software to create a simulation model of the customer queue system in the cinema so as to reduce the occurrence of queues. Cinema managers are expected to implement a policy when to open new counters so that there are no idle or too busy counters so that service for cinema customers is maximized.

Methodology

Based on the background that has been presented, the problem of optimizing services in cinema Z is formulated, further determining the goals, limitations and collecting data. At the data collection stage, direct observations are carried out at the cinema counter Z. Direct observation to find out the real system conditions at the service facility. The data collected are data on arrival time, service time, and end time served at Z cinema. Furthermore, data processing and analysis is carried out using Arena 16.0 software. According to Rossetti (2016), simulation method as in Figure 1.
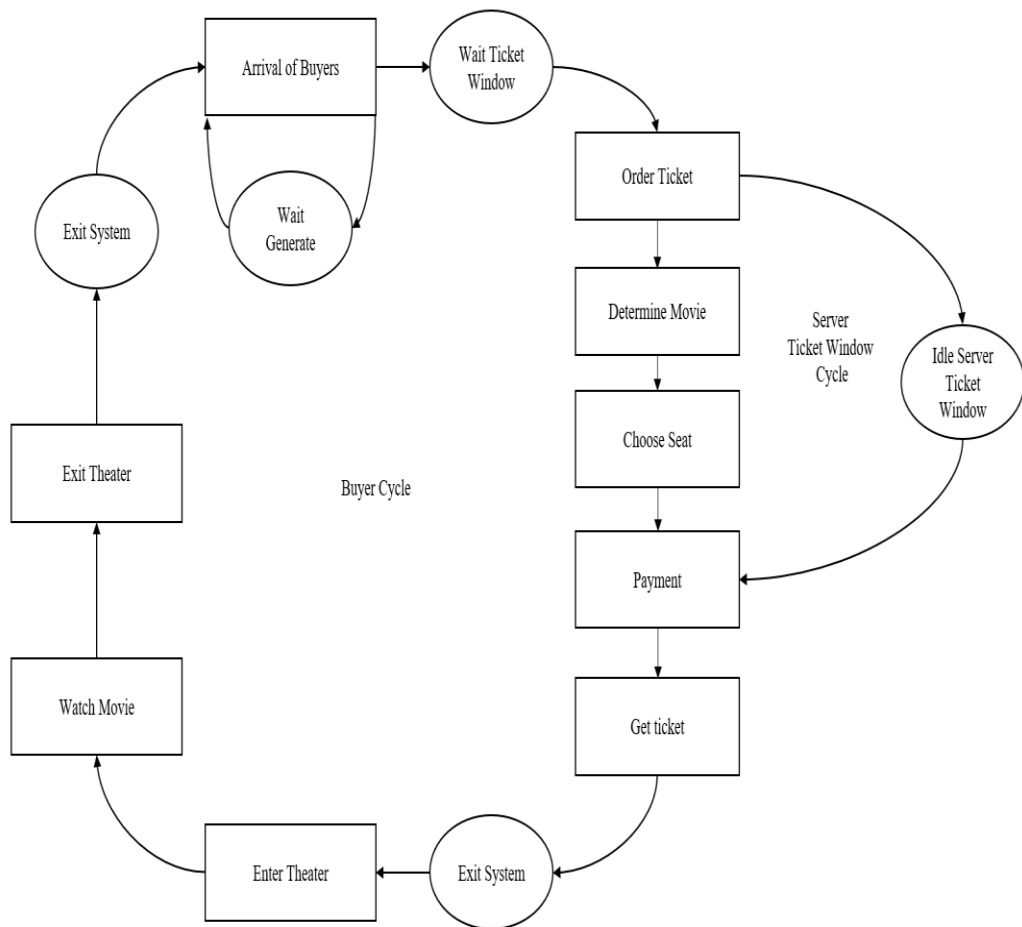
Figure 1. Research Flowchart

JARES (Journal of Academic Research and Sciences), *(8)1*, *page* 40-44.
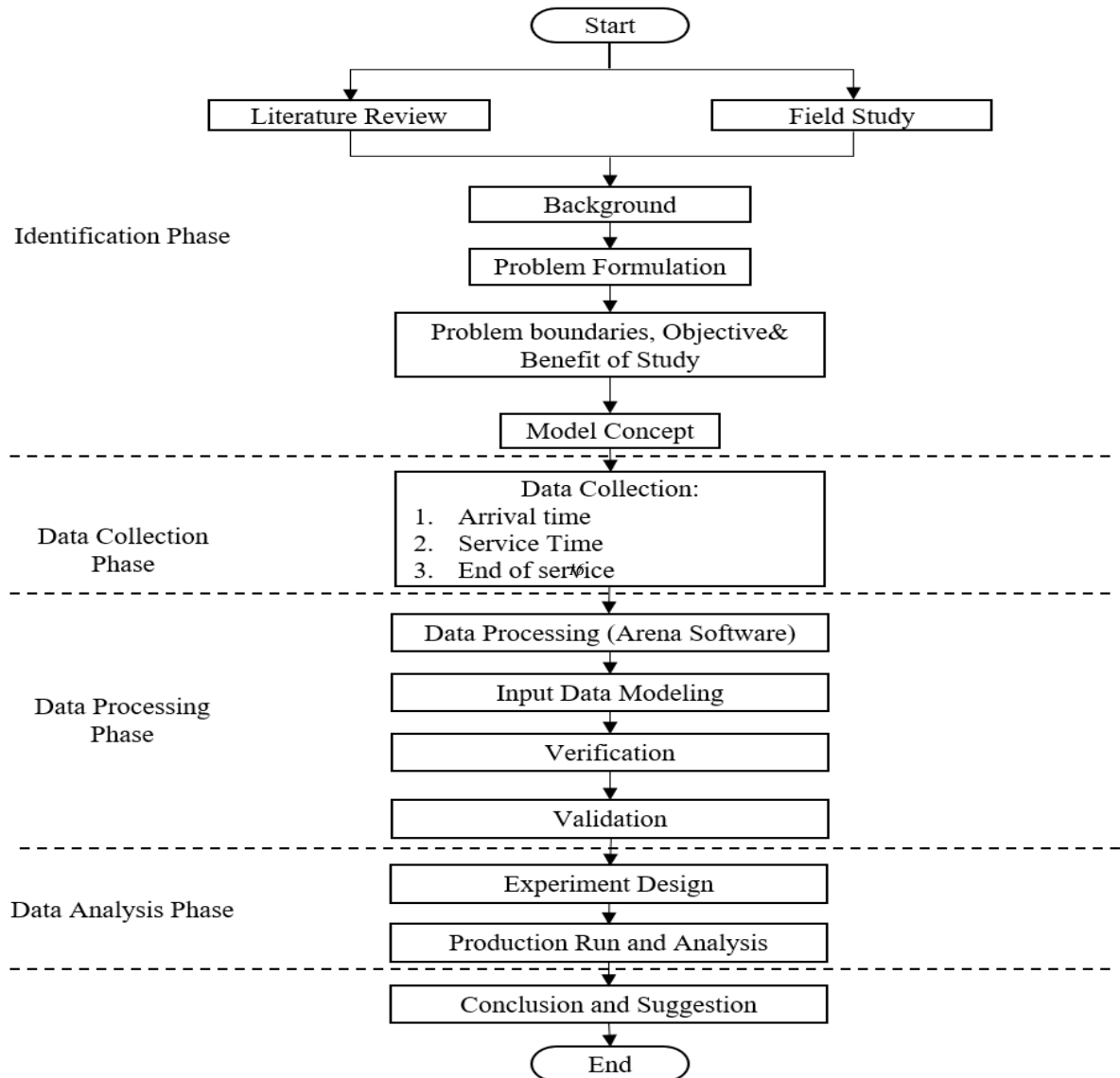
The limitations of the problem in this study are:

1. Research conducted on the queue for purchasing cinema tickets

2. Research conducted on direct ticket purchases

3. Observations are carried out in a duration of 1 hour (13.00-14.00)

igure 2.   *Activity Cycle Diagram*

This study uses several assumptions, namely:
1. It is assumed that no customer cancels the transaction
2. The arrival of customers in groups is counted one that goes into the queuing system
3. It is assumed that 50% of subscribers after purchasing enter the theater and another 50% exit the cinema to wait for the screening of the film.

Result and Discussion

The results of the research from the queue simulation that has been carried out on the Z cinema ticket counter queue are as follows:

a.   The value of the Number In and Number Out items shows that the number of customers that can be served by the system reaches 100%, which is 100 people.

b.   The value of the wait time item can be known that the customer waits in the queue before the service at the counter for a maximum of 13.68 minutes and at the proposed model of 4.3 minutes.

c.   Based on the results of the item, the total time of counter employees serving customers with a minimum length of time is 1,326 minutes and the maximum is 17,772 minutes. While in the proposed model, the minimum service is 1.23 minutes and maximum 8.46 minutes.

d.   The waiting time of customers (waiting time) at the counter is a maximum of 13.68 minutes, while in the proposed simulation model, the maximum waiting time is 4.3 minutes.

e.   Many queues (number waiting) at the ticket counter are a maximum of 11 people. While in the proposal a maximum queue of 4 people.

Conclusion

Based on the results of the analysis of the cinema queue simulation model in the current conditions, an improvement proposal was made to improve the cinema ticket queue. The proposal given is the addition of 1 e-ticket counter.

For future research, researcher may retrieve data for the whole day instead of just 5 hours, so that the simulation created can represent a real system. Also, researcher can evaluate the proposed improvements, whether the addition of 1 e-ticket counter is effective.

Acknowledgements

References

Adacher, L. F. (2017). A Model to Optimize the Airport Terminal Departure Operations. Transportation Research Procedia, 27, 53-60. https://doi.org/10.1016/j.trpro.2017.12.151.

Adeke, P. (2018). Modelling of Queuing Process at Airport Check-In System: A Case Study of Manchester and Leeds-Bradford Airports. Nigerian Journal of Technology, 37, 35-43.

Adeniran, A. a. (2018). Relationship between Passengers' Satisfaction and Service Quality in Murtala Muhammed International Airport, Lagos, Nigeria. International Journal of Research in Industrial Engineering, 7, 349-369.

Alamutu, S. (2018). Application of Queuing Model to Ease Traveler's Flow in Nigerian International Airports. Journal of Business and Management, 20, 17-28.

Alodhaibi, S. B. (2019). Impact of Passenger-Arrival Patterns in Outbound Processes of Airports. Proceedia Manufacturing, 30, 323-330.

Al-Sultan, A. (2015). Airport Check-In Optimization by IP and Simulation in Combination. International Journal of Mathematical and Computational Sciences, 9, 403-406.

Al-Sultan, A. (2018). Simulation and Optimization for Modeling the Passenger Check-In System at Airport Terminal. Review of Integrative Business and Economics Research, 7, 44-53.

Anonim. (2015, September 22). Teori Antrian. Retrieved from http://dapatbuku.blogspot.co.id/2015/09/teori-antrian_65.html

Araujo, G. a. (2015). Optimizing the Airport Check-In Counter Allocation Problem. The Journal of Transport Literature, 9, 15-19.

Bronson, Richard, & Hans, J. W. (1982). Teori dan Soal-Soal Operation Research. Jakarta: Erlangga.

Drevna, M. a. (1994). Introduction to Arena. Proceedings of the 1994 Winter Simulation Conference, Lake Buena Vista, 11-14 December, 519-523.

Enciso, J. V. (2016). Modeling and Simulation of Passenger Traffic in a National Airport. 14th LACCEI International Multi-Conference for Engineering, Education, and Technology, San Jose, 20-22 July, 1-8. https://doi.org/10.18687/LACCEI2016.1.1.217.

FAAN. (2019). Murtala Muhammed Airport Apron Control Data. Federal Airports Authority of Nigeria.

Harchol-Balter, M. (2013). Performance Modeling and Design of Computer Systems: Queueing Theory in Action. Cambridge University Press, Cambridge.

Hasan, M. I. (2002). Teori Pengambilan Keputusan. Jakarta: Ghalia Indonesia.

Heyde, C. H. (2001). Statisticians of the Centuries. Springer, New York., https://doi.org/10.1007/978-1-4613-0179-0_70.

Husnan, S. (1982). Teori Antrian. Yogyakarta: BPFE.

O. O. Olusanya, J. L. (2020). Development of a Model for International Traveler's Check-In Process Using Arena Software Tool. Engineering. Vol.12 No.11, November, DOI: 10.4236/eng.2020.1211057 .

Patel, V. (2018). Airport Passenger Processing Technology: A Biometric Airport Journey. Master's Degree Thesis, Embry-Riddle Aeronautical University, Prescott, 5-12.

Rossetti. (2016). Simulation Modeling and Arena 2nd Edition. Wiley.

Siagian, P. (1987). Penelitian Operasional: Teori dan Praktek. Jakarta: Universitas Indonesia Press.

Taha, H. A. (1997). Riset Operasi: Suatu Pengantar Jilid 2. Terjemahan Daniel Wirajaya. JakartaBinarupa Angkasa.

Teilans, A. K. (2008). Design of UML Models and Their Simulation Using ARENA. WSEAS Transactions on Computer Research, 3, 67-73.

Trakoosanti, L. (2016). A Process Simulation Model of Airline Passenger Check-In. Universal Journal of Management, 4, 265-276. https://doi.org/10.13189/ujm.2016.040506.

Wardhani, I. K., Pratiwi, I. P., & Liquiddanu, E. (2018). Analisis Kinerja Antrian Menggunakan Software Arena 15.0 (Studi Kasus Bioskop Z). Seminar dan Konferensi Nasional IDEC.

Wereh, H. S., Mekel, A. P., & Nelwan, O. (2014). Analisis Sistem Antrian Pada PT Sinar Pasifik Internusa Manado. Jurnal EMBA, 2, 1371-1380.

Winston, W. (1991). Operations Research: Applications and Algorithms. 2nd Edition, PWSKent Publishing, Boston.